Using Open Systems Architecture to Revolutionize Capability Acquisition

Acquisition Reform Symposium
13 May 2015

Nickolas Guertin, PE
DASN RDT&E, Director for Transformation
Nickolas.H.Guertin@navy.mil

Co-authored by Robert Sweeney & Douglas Schmidt, PhD

Opinions expressed are those of the authors & do not reflect official policy or position of the US Government

Distribution Statement A: Approved for public release

Imperatives for Continuous Improvements -1

- **Capability Improvements Needed**
  - The United States' military technological superiority is being challenged … This is not a future problem, nor is it speculative. My concerns are based on the intelligence reports I have received on a daily basis for almost five years.

    —Hon. Frank Kendall

    Under Secretary of Defense for Acquisition Technology & Logistic

    December 2014

Imperatives for Continuous Improvements -2

- **Systems must be updated quickly for CYBERSAFE**
  - Cybersecurity standards must be applied & re-applied to every system throughout its service life, not just at initial acquisition. Once it delivers, even if it delivers perfectly — zero vulnerabilities, zero attack surface — the *next day,* it will be vulnerable because of a new discover

    — VA eet, 20 April 2015

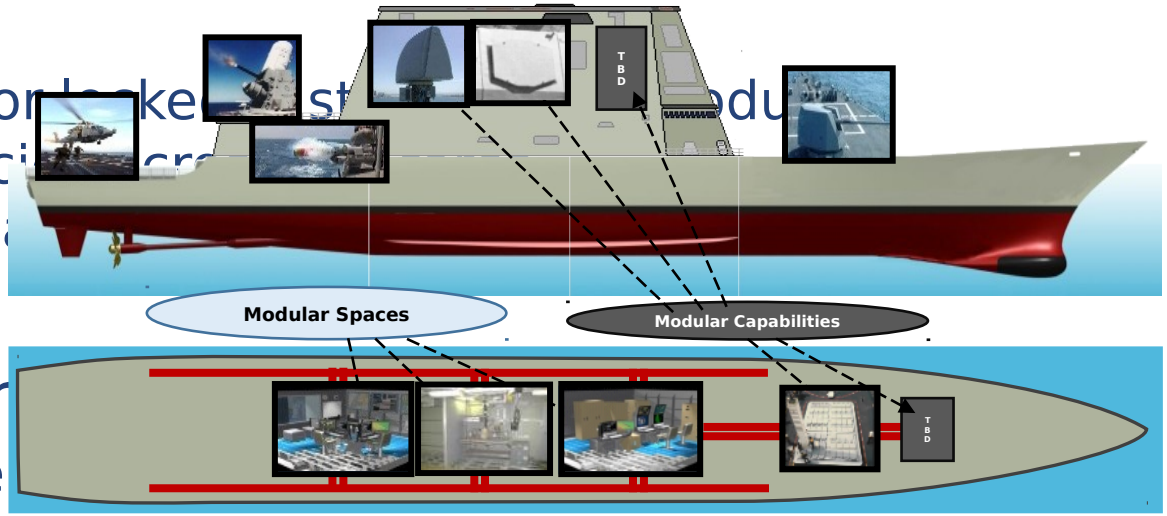
The Naval Business Model – Top-Level Strategy

Procure Basic Platforms

- Decouple the mission systems & integration from the platform
- Able to quickly change modular components for future flexibility
- Stabilize platform production – segregate from rapid change

Develop/Maintain Capability Product Lines

- Reduce & manage vendor [illegible] st[illegible]odu
- Improve core competenci[illegible]cr[illegible]
- Design for robust, afford[illegible]
- Build in adaptability



Integrate & Deliver

- Manage Platform-unique [illegible]
  [illegible]ements
- Reduce acquisition cost & risk
- Spur innovation & enhance

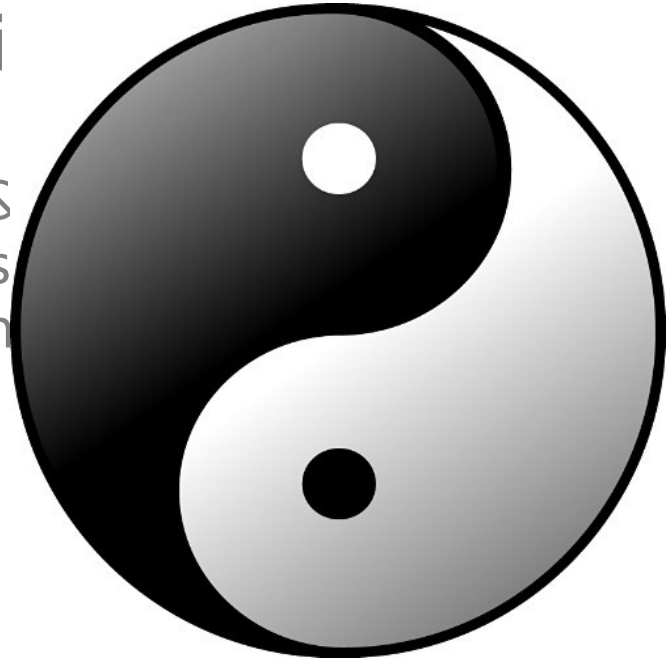
The Naval Business Model – Top-Level Strategy

Procure Basic Platforms

- Decouple the mission systems & integration from the platform
- Able to quickly change modular components for future flexibility
- Stabilize platform production – segregate from rapid change

Develop/Maintain Capabili Lines

- Reduce & manage vendor-locked &
- Improve core competencies across
- Design for robust, affordable testin
- Build in adaptability

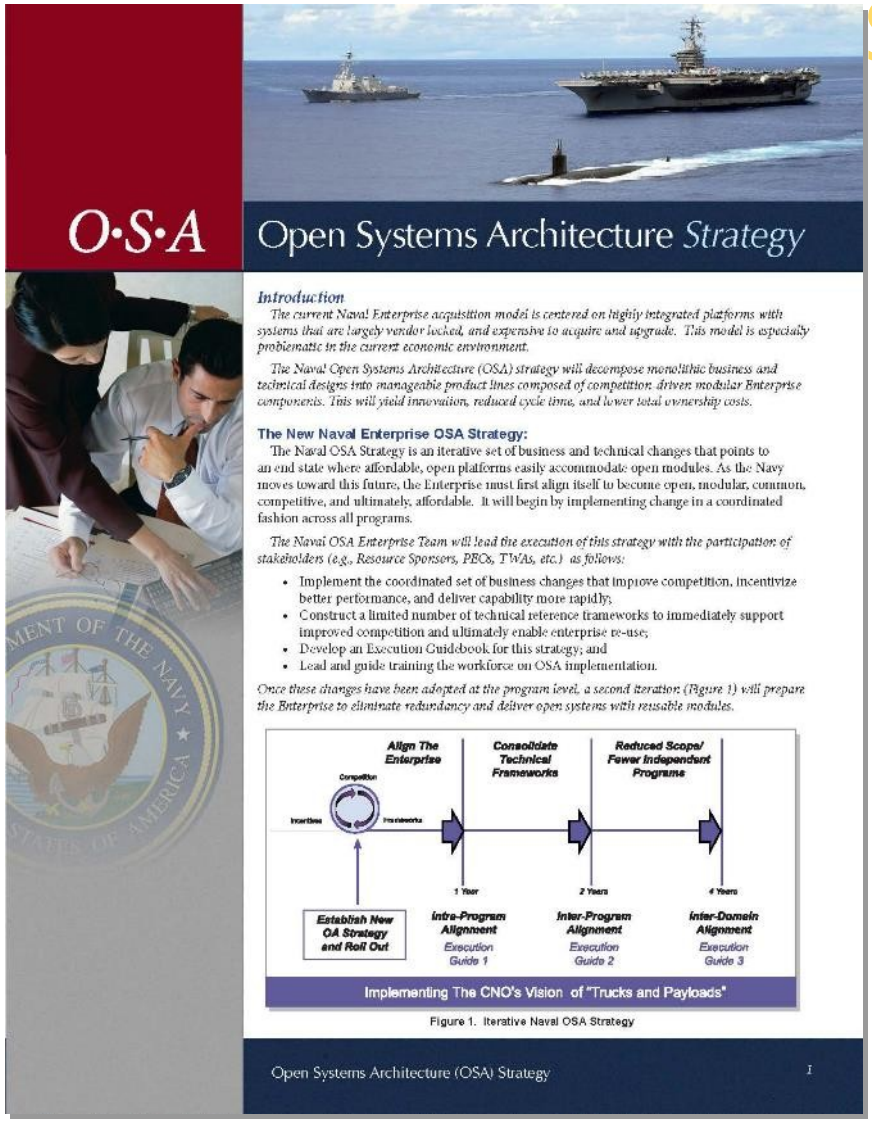


Integrate & Deliver

- Manage Platform-unique
  ements
- Reduce acquisition cost & risk

This strategy requires alignment between business &

Naval Open Systems Architecture (OSA) Strategy


O·S·A

Open Systems Architecture *Strategy*

Introduction

The current Naval Enterprise acquisition model is centered on highly integrated platforms with systems that are largely vendor locked, and expensive to acquire and upgrade. This model is especially problematic in the current economic environment.

The Naval Open Systems Architecture (OSA) strategy will decompose monolithic business and technical designs into manageable product lines composed of competition driven modular Enterprise components. This will yield innovation, reduced cycle time, and lower total ownership costs.

The New Naval Enterprise OSA Strategy:

The Naval OSA Strategy is an iterative set of business and technical changes that points to an end state where affordable, open platforms easily accommodate open modules. As the Navy moves toward this future, the Enterprise must first align itself to become open, modular, common, competitive, and ultimately, affordable. It will begin by implementing change in a coordinated fashion across all programs.

The Naval OSA Enterprise Team will lead the execution of this strategy with the participation of stakeholders (e.g., Resource Sponsors, PEOs, TWAs, etc.) as follows:

- Implement the coordinated set of business changes that improve competition, incentivize better performance, and deliver capability more rapidly;
- Construct a limited number of technical reference frameworks to immediately support improved competition and ultimately enable enterprise re-use;
- Develop an Execution Guidebook for this strategy; and
- Lead and guide training the workforce on OSA implementation.

Once these changes have been adopted at the program level, a second iteration (Figure 1) will prepare the Enterprise to eliminate redundancy and deliver open systems with reusable modules.

Figure 1. Iterative Naval OSA Strategy

Open Systems Architecture (OSA) Strategy 1

- **Technical Reference Frameworks (TRFs)**
  - Defined & managed by Government/Industry consortia
  - Used across multiple air, surface, submarine & ground platforms
  - Risk Prudent, modular competition
  - Access to innovation & timely deployment of improvements
- **Open Product Lines**
  - Implement TRFs using open standards
- **An IP Strategy that breaks down barriers to entry**
  - Developing for DoD is safe
  - Protect industry investments
  - Protect Government from

OSA

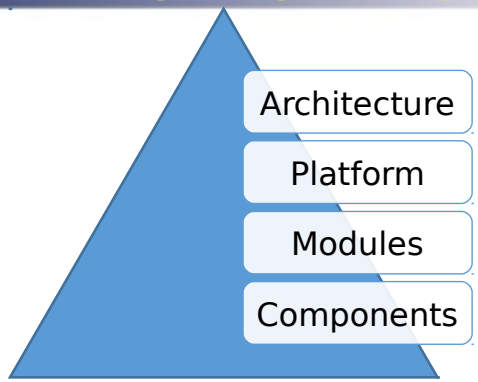
See acc.dau.mil/osastrategy

Emphasis is on both business & technology innovations

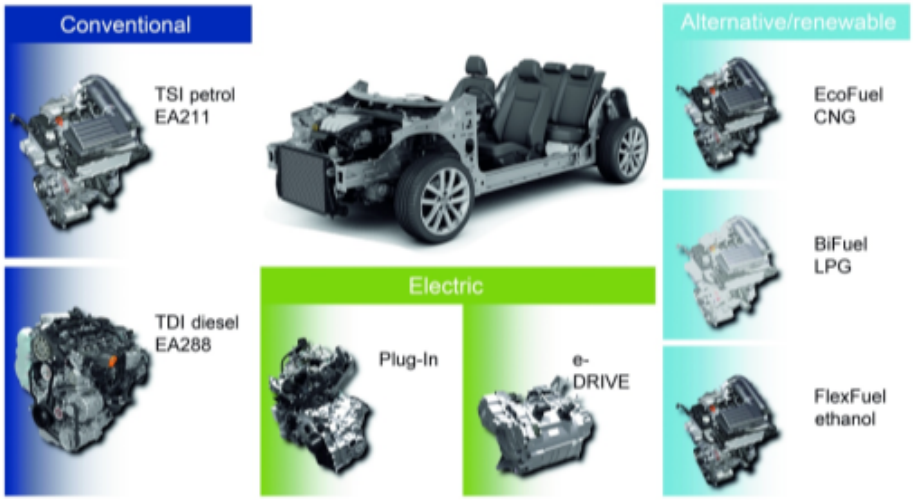
Industry Trend - Common Platforms

Top 12 OEMs	2010	2020
Automobile platforms	223	154
Units based on 10 ten core platforms (millions)	17	33
Units based on OEM core platforms	39%	95%
3 core platforms or less per OEM		

Common platforms have proven track record to reduce cost & time to market



VW MQB Common Platform



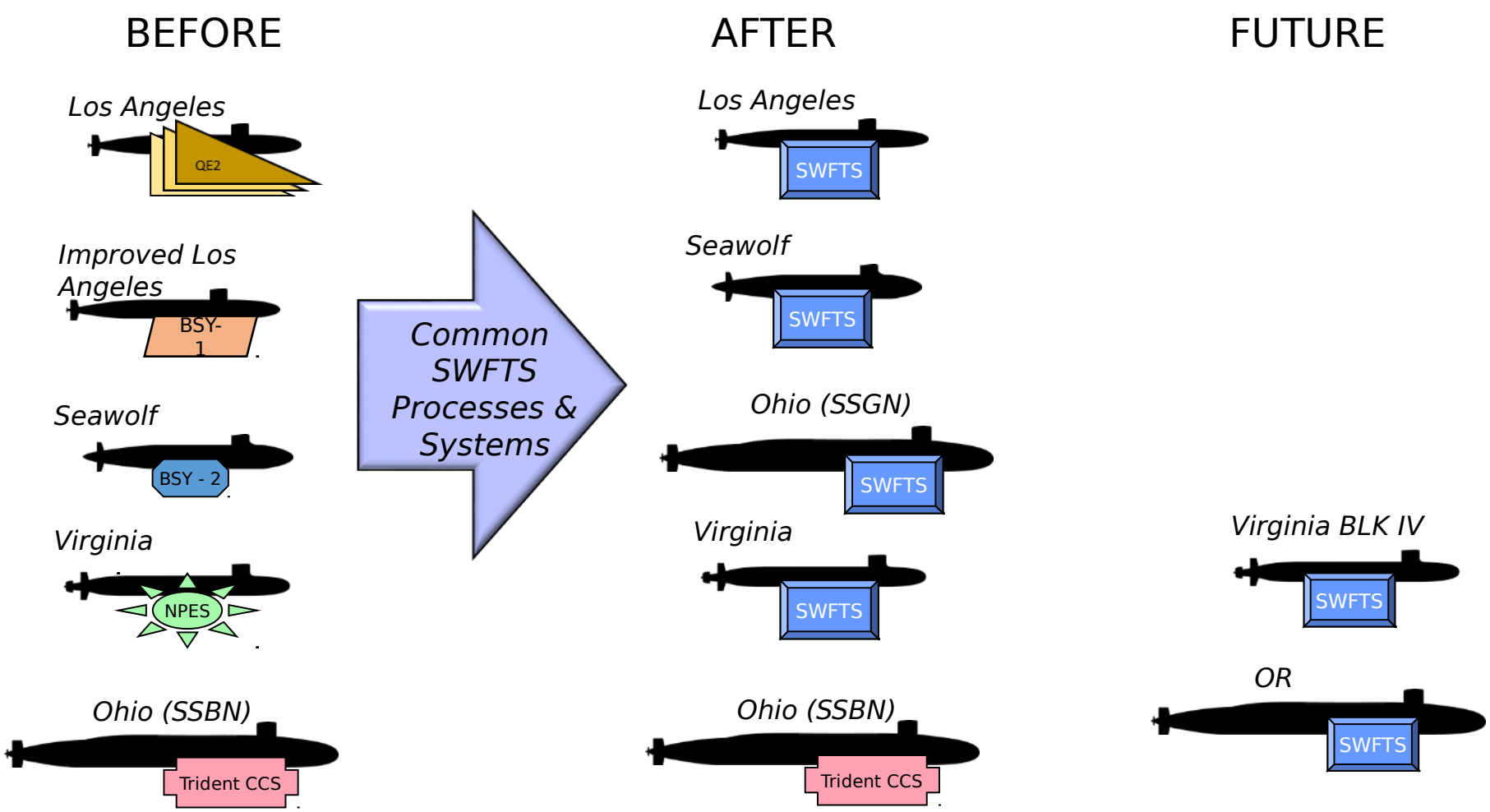
Top 10 global megaplatforms

Forecast volume and number of models for 2017

OEM	Platform	Volume (in mn)	No. of Models	Sample models
1. VW	MQB	6.3	41	VW Golf, Passat; Audi A3
2. Toyota	MC	5.2	25	Auris, Corolla, Vibe: Scion xB
3. Hyundai/Kia	HD	3.0	16	Hyundai i30; KiaCee'd
4. GM	Delta	2.5	19	Opel Astra; Chevrolet Cruze
5. PSA	EMP2	2.3	24	Peugeot 308; Citroen C4, DS4
6. Renault/Nissan	B	2.2	10	Renault Clio; Nissan Cube, Juke, Leaf
7. Ford	C1	2.2	18	Focus, C-Max, Kuga
8. Hyundai/Kia	PB	1.9	18	Hyundai i20; Kia Rio, Venga
9. Renault/Nissan	CMF1	1.9	20	Renault Megane, Nissan Qashqai
10. Ford	B2E	1.8	11	Fiesta, B-Max; Mazda2/Demio
Subtotal		29.4	202	

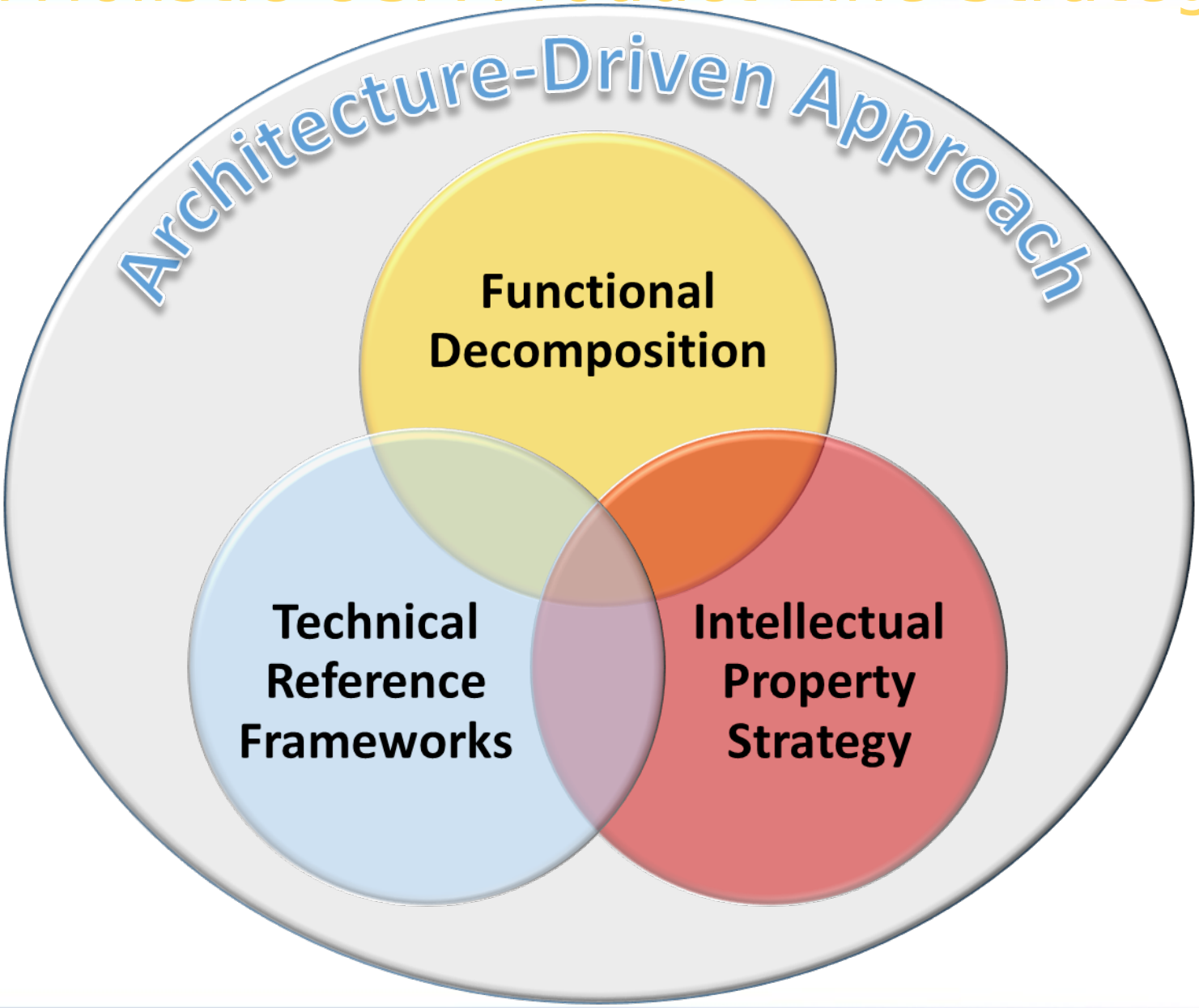
Source: IHS Automotive, AlixPartners analysis

Product-Line Benefits in Action



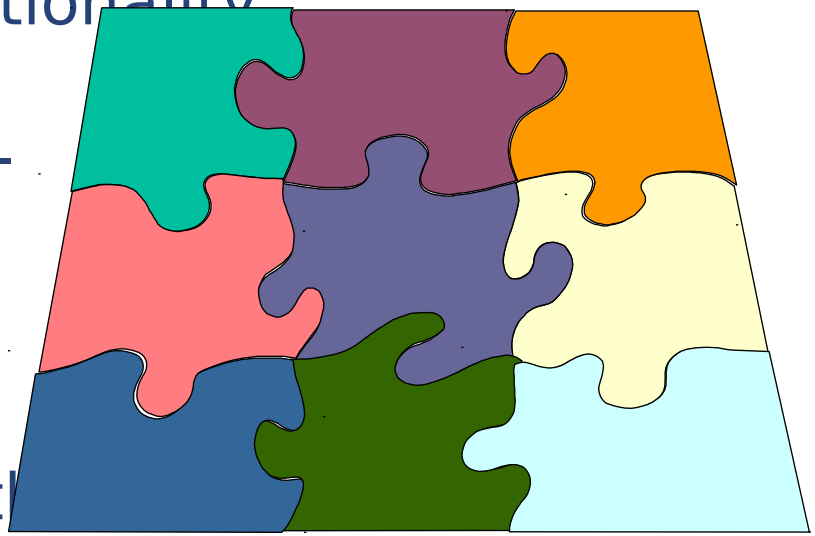
Submarine Classes Contain the Same Product-Line Subsystems
Five independent support infrastructures consolidated & continuously improved

A Holistic OSA Product-Line Strategy



Modular Unit Functional Decomposition

- Decompose & modularize functional capabilities
- Module contains minimum functionality suitable for enabling upgrades, competitive acquisition & cross-system portability
- Assess modular capabilities for suitability for commoditization
- Due to the depth & breadth of t modularization effort, it will be an ongoing effort over the course of multiple years
- Modularizing common capabilities enables development product lines for deliberate capability reuse



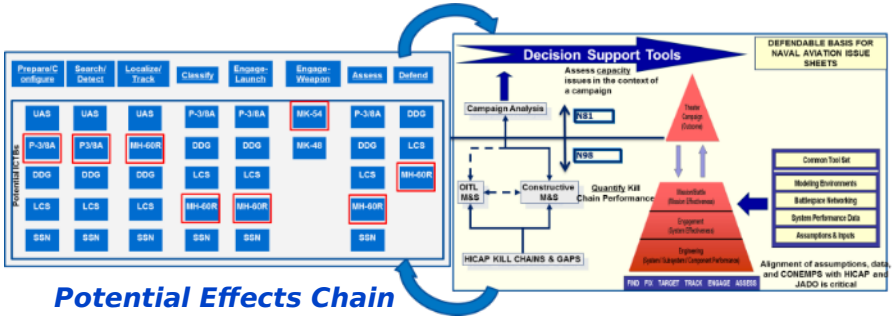
OSA

The 1st Step in Implementing an OSA Strategy is

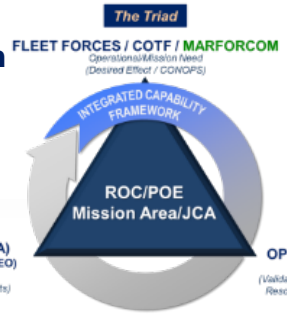
Mission Area Capability Management

Integrated Warfighting Capability (IWC) Enterprise Team

Governance



Mission Technical Baseline - solution agnostic
- **Timeframe, Location, Risk, Threat, Commanders Intent, Desired effects**

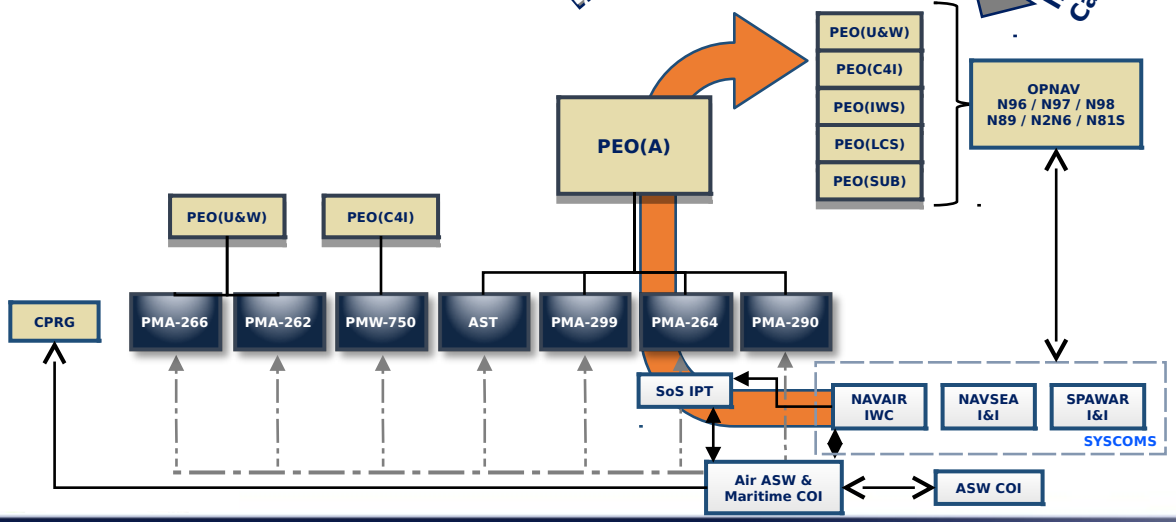


Integrated Capability Technical Baseline (ICTB)
(SoS requirements, interfaces & standards)
- **Capability, Affordability, Timeline Trade Space analysis**

Feedback loop

IWCP

Integrated Warfighting Capability Package

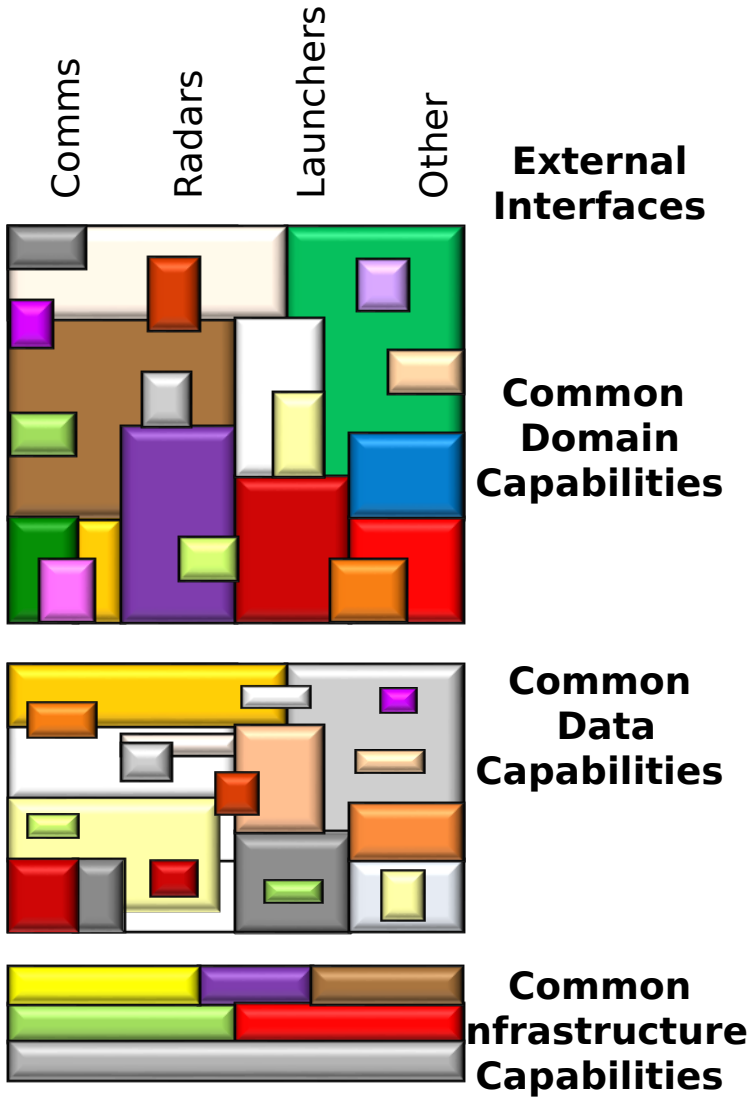


Deliver warfighting affordable, integrated, & interoperable capabilities using open & standard processes & tools

Product Line Determination Method

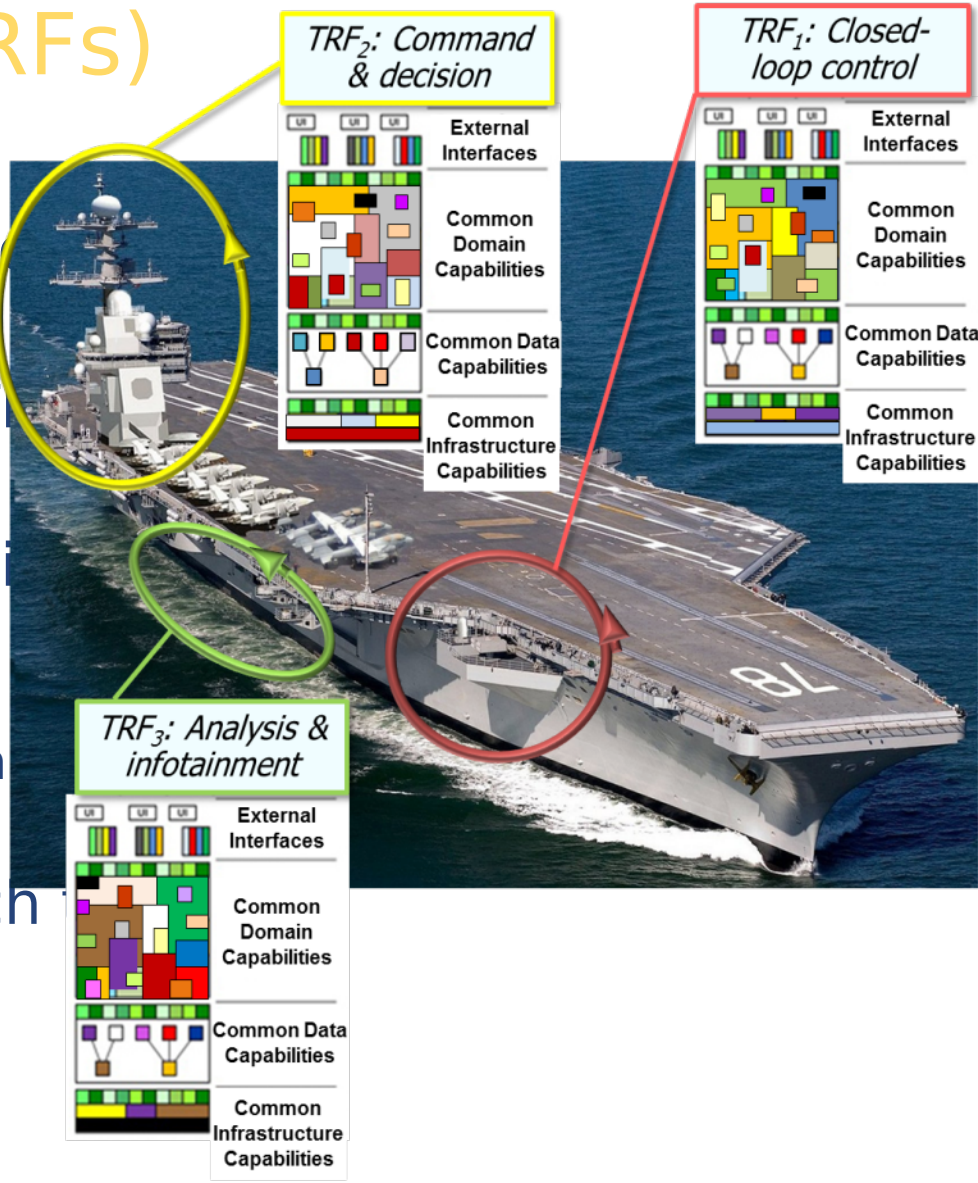
Modules defined during Functional Decomposition fall into one of four categories:

1. Common across a number of platforms & should be commoditized for savings via reuse
2. Capture/define important external interfaces & should be commoditized with a goal of increased interoperability through commonality
3. Very high rate of change & program specific
4. Truly program unique & unchanging



Technical Reference Frameworks (TRFs)

- TRFs are key to use of OSA
  - e.g., FACE, UCS, HOST, & SPIES
- Navy has various uncoordinat TRFs at varying maturity leve
- Enterprise approach applies T to enable Open Product Lines
- Must account for programmati realities
  - New programs would use them
  - Legacy programs need to determ which TRFs to use & when
- TRFs need enterprise approach ensure benefits & compliance

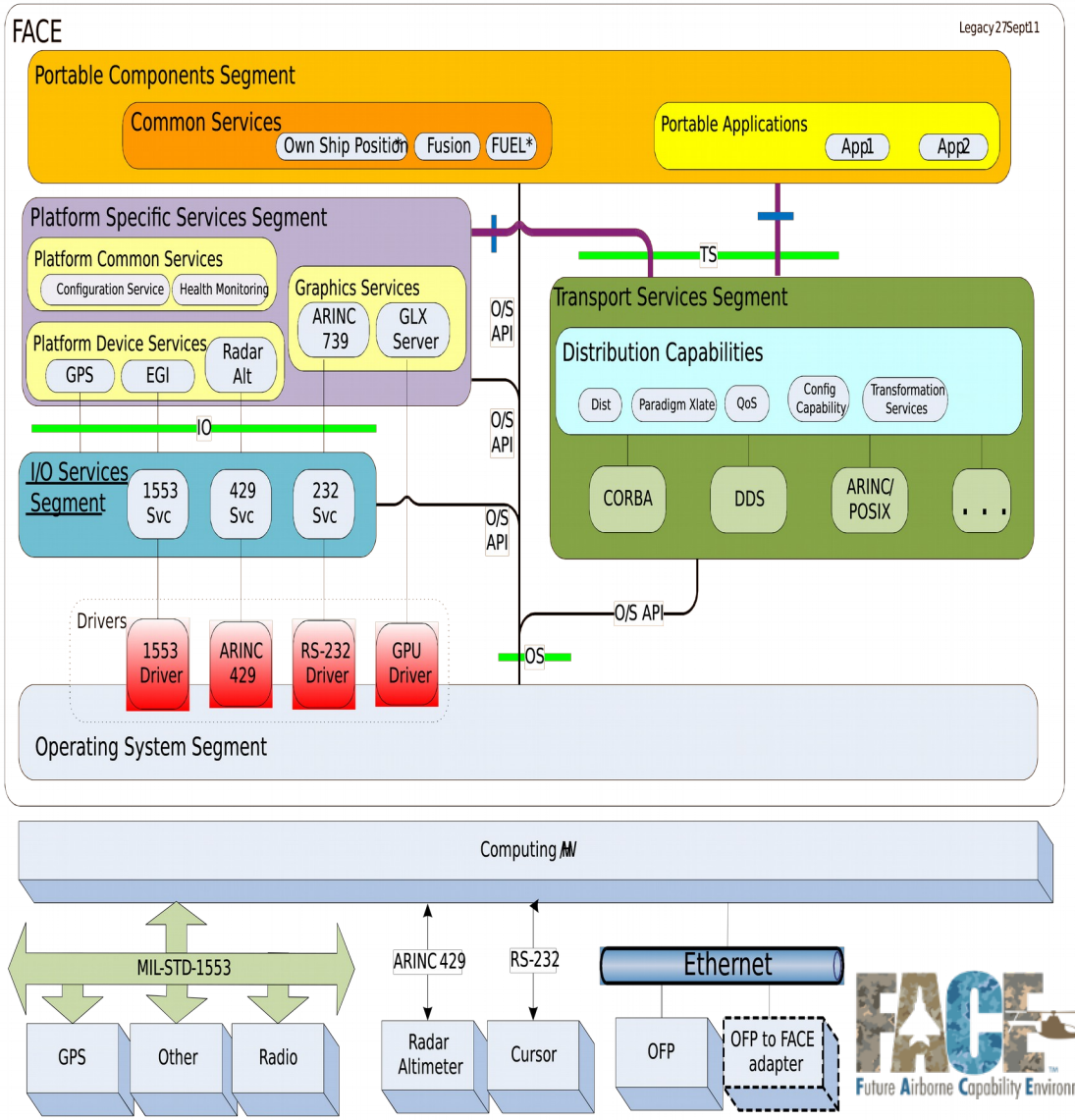


The 2nd Step in Implementing an OA Strategy is the

FACE – a Gov't led, Industry Supported TRF

Key attributes

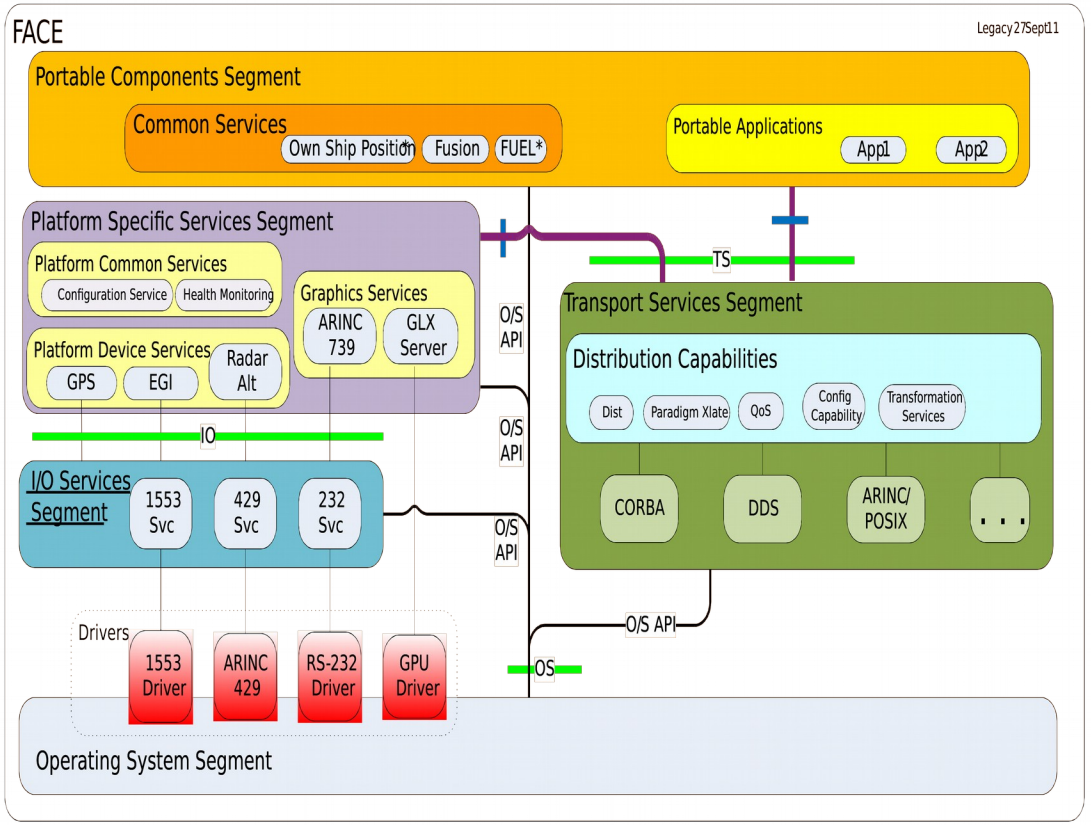
- *Crisply defined software & system technical architecture*
  - TRFs enable competition at multiple system levels

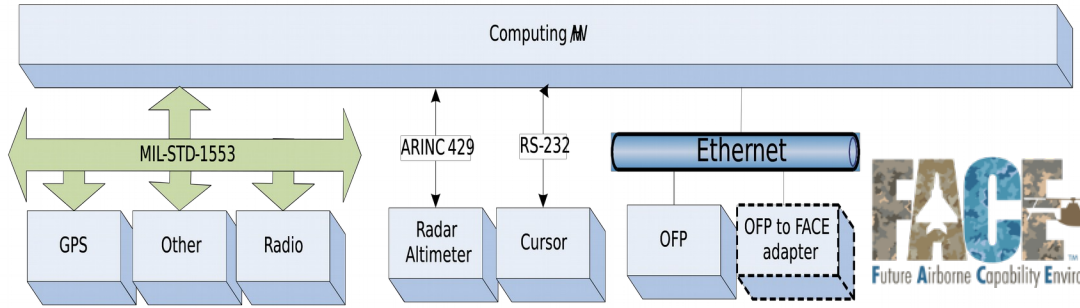


FACE – a Gov't led, Industry Supported TRF

Key attributes

- *Crisply defined software & system technical architecture*
- *Modular innovation potential*
  - Economically-guided criterion for (de)composing TRFs into modules

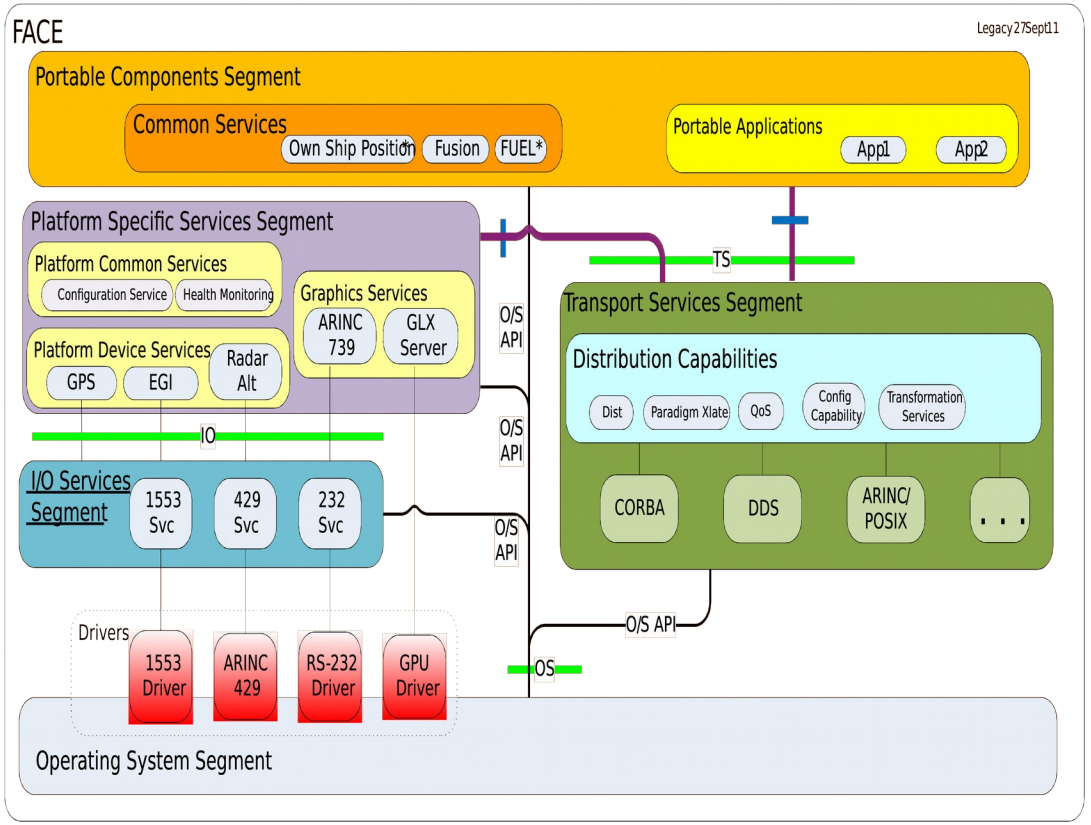


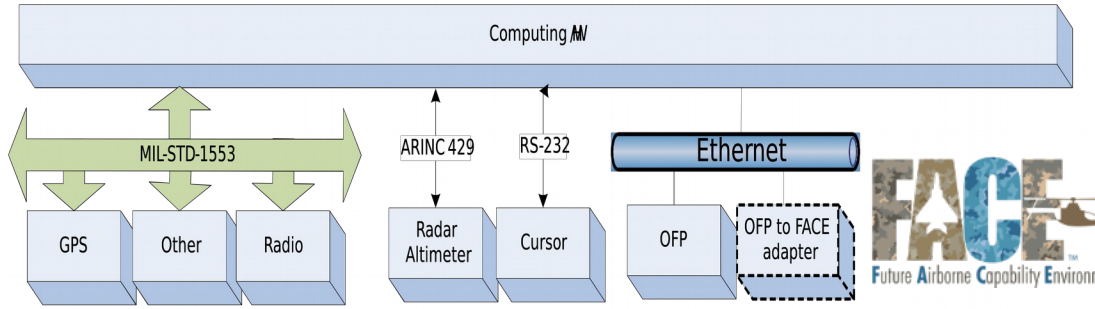


FACE – a Gov't led, Industry Supported TRF

Key attributes

- *Crisply defined software & system technical architecture*
- *Modular innovation potential*
- *Competitive evolutionary procurement processes*
  - Enable improvements throughout acquisition program lifecycles





True competition requires robust interoperable open

Enterprise Management Objectives

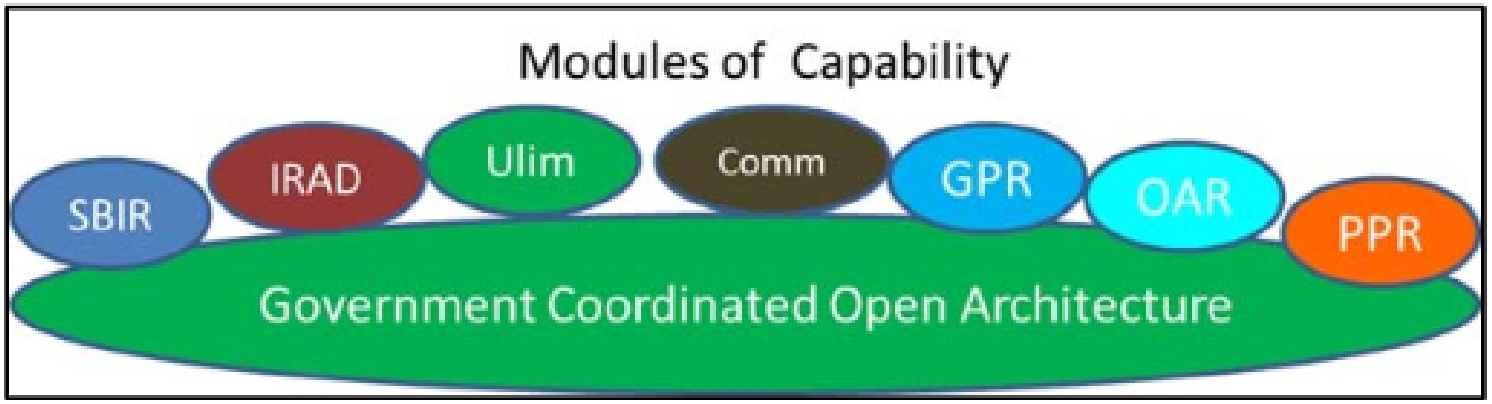
- To achieve enterprise level savings via economy-of-scale, efficiencies, & systematic reuse of common assets
- To oversee development of TRFs & Open Product Lines
- To oversee the program's cut-in plans for TRFs & Open Product Lines
- To evolve over time & across program lifecycles

OSA

The 3rd Step in an OSA Strategy is Adoption of Open Product

Open Acquisition Intellectual Property Strategy

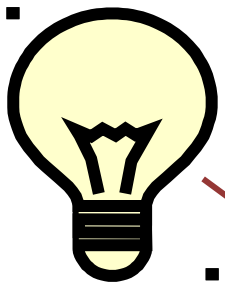
- Government as Business Integrator
- Choose where to invoke license rights to design data
  - Architecture & interfaces
  - What the Government paid to develop
- Choose where to invoke innovation
  - Where warfighting requirements change quickly
  - Where the Commercial sector is investing
  - Where there are multiple strong providers



IP Strategy for an Open Product Line

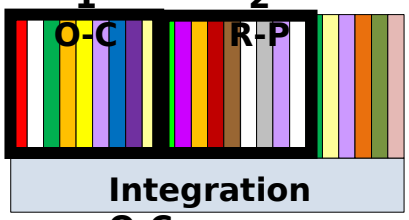
Competition Across the Lifecycle

- Competition for O-C
- Replacement for R-P



TECHNOLOGY

CONTRACTS



WARFIGHTER

REQUIREMENTS

Functional Module 1 O-C

Functional Module 2 R-P

. . .

Integration O-C

Benefits of Open Product Lines

siness

ompetition for components & integration services

nternational cooperation & foreign sales opportunitie

Vider array of providers for upgrades

pen currently closed markets

ommon capabilities used across multiple platforms

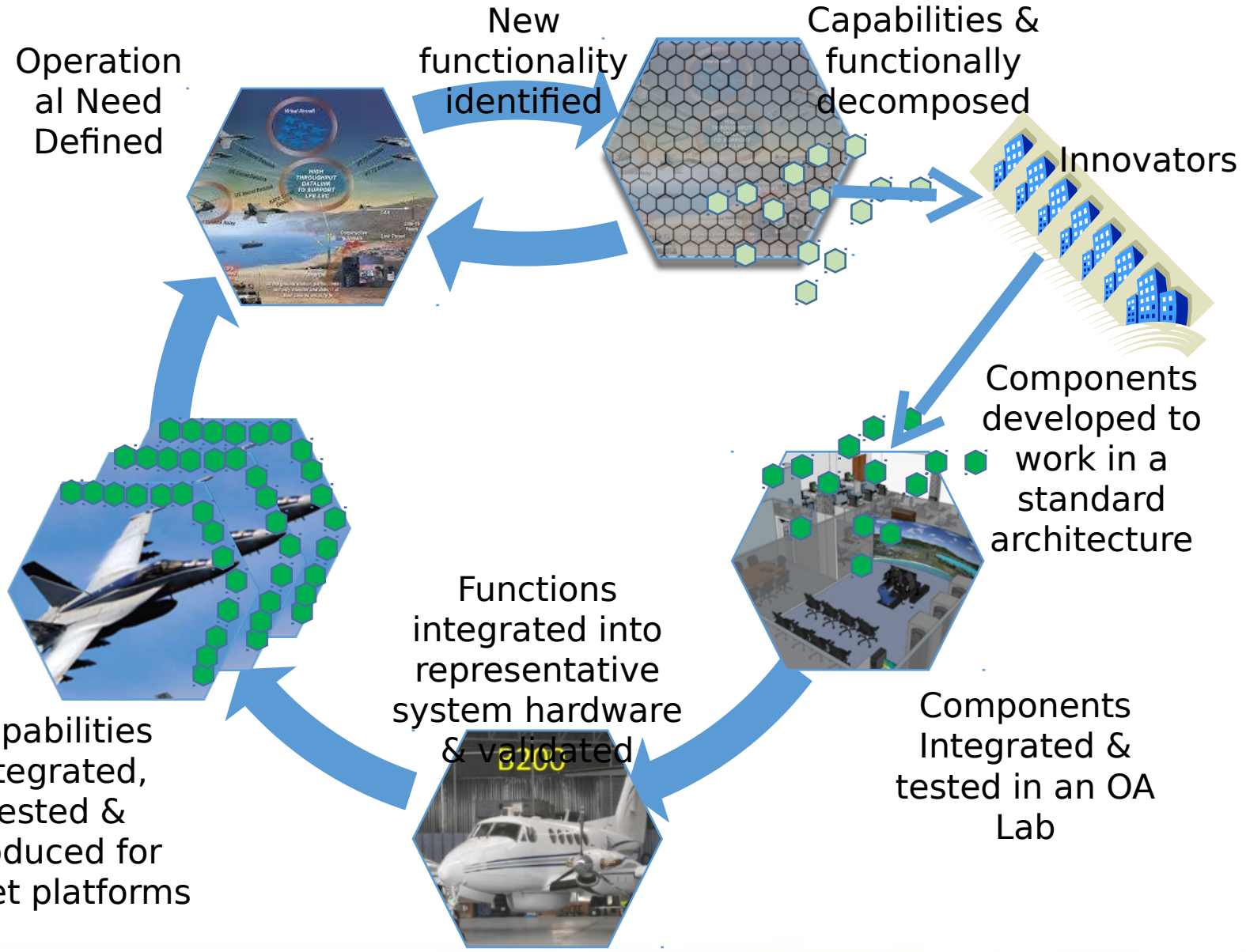
Technical

1. Common training, operations & maintenance
2. S&T risk reduction and & focus on new value
3. More robust application of CYBERSAFE techniques
4. Risk reduction for transition of new technologies
5. Consolidation of infrastructure

OSA

We need both business & technology innovations

Mapping How We Get There


Operation al Need Defined
New functionality identified
Capabilities & functionally decomposed
Innovators
Components developed to work in a standard architecture
Components Integrated & tested in an OA Lab
Functions integrated into representative system hardware & validated
Capabilities integrated, tested & produced for target platforms